90-Day Cycle Report:
Productive Persistence

Statway Winter Institute
1-30-11

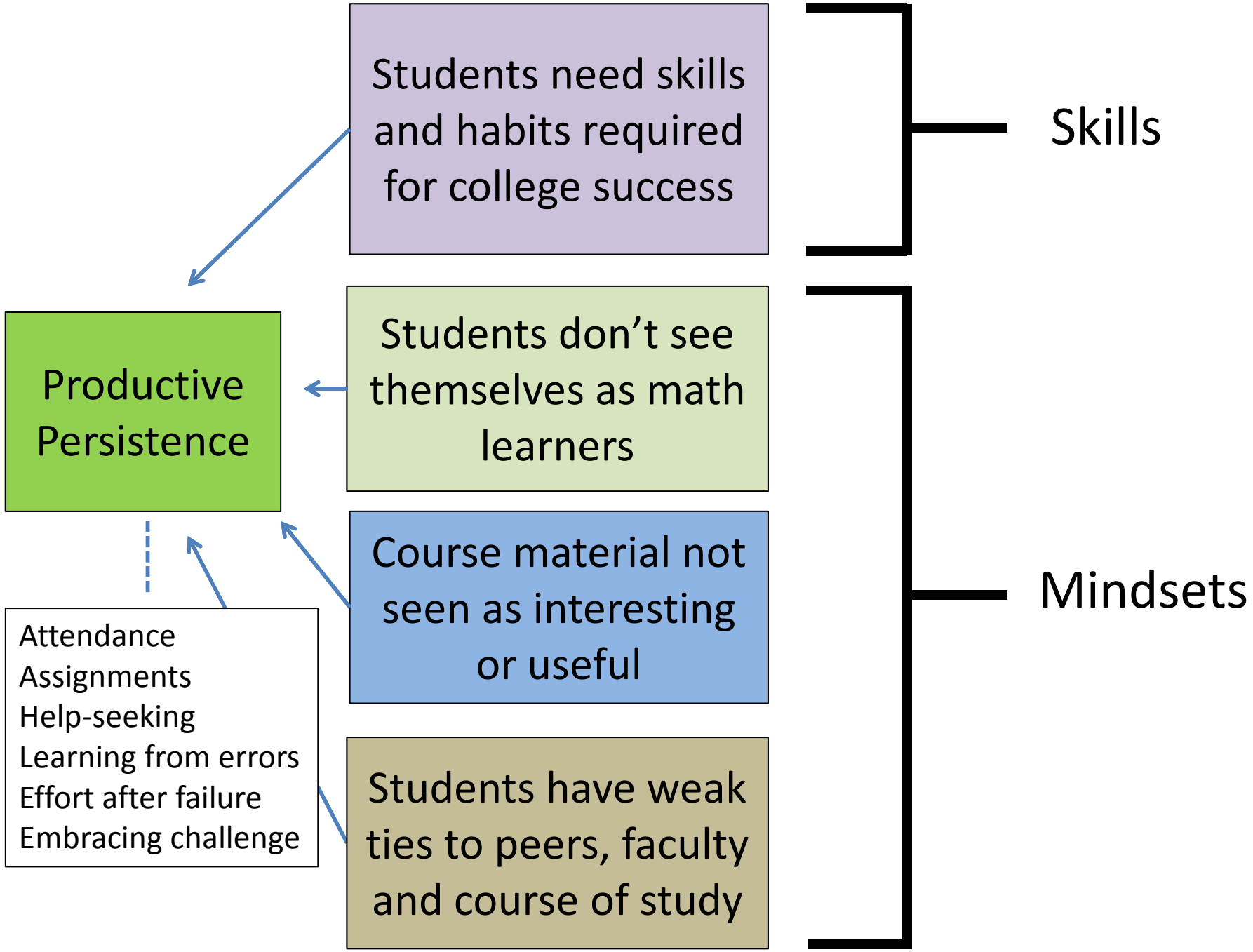
David Yeager
Jane Muhich
Rose Asera
Laura Torres

Developing the Model of Change

- Math Faculty:
  - Surveys of math faculty
  - Statway summer institute
- Interviews with students:
  - Students attending Foothill college.
  - Arleen Arnsparger, from the CCCSE.
- Reviews of the literature, emphasizing articles authored by:
  - Bandura; Beilock; Cohen; Duckworth; Elliot; Hulleman; Dweck; MDRC; Oyserman; Vansteenkiste; Walton; Zimmerman
- Tests of the model:
  - Uri Treisman
  - Arleen Arnsparger,
  - Lawrence Morales,
  - Jane Muhich
  - Rose Asera
  - Mary Ann Firpo
- Coaching:
  - Lindsay Martin, IHI

What is productive persistence?

Tenacity + Good strategies

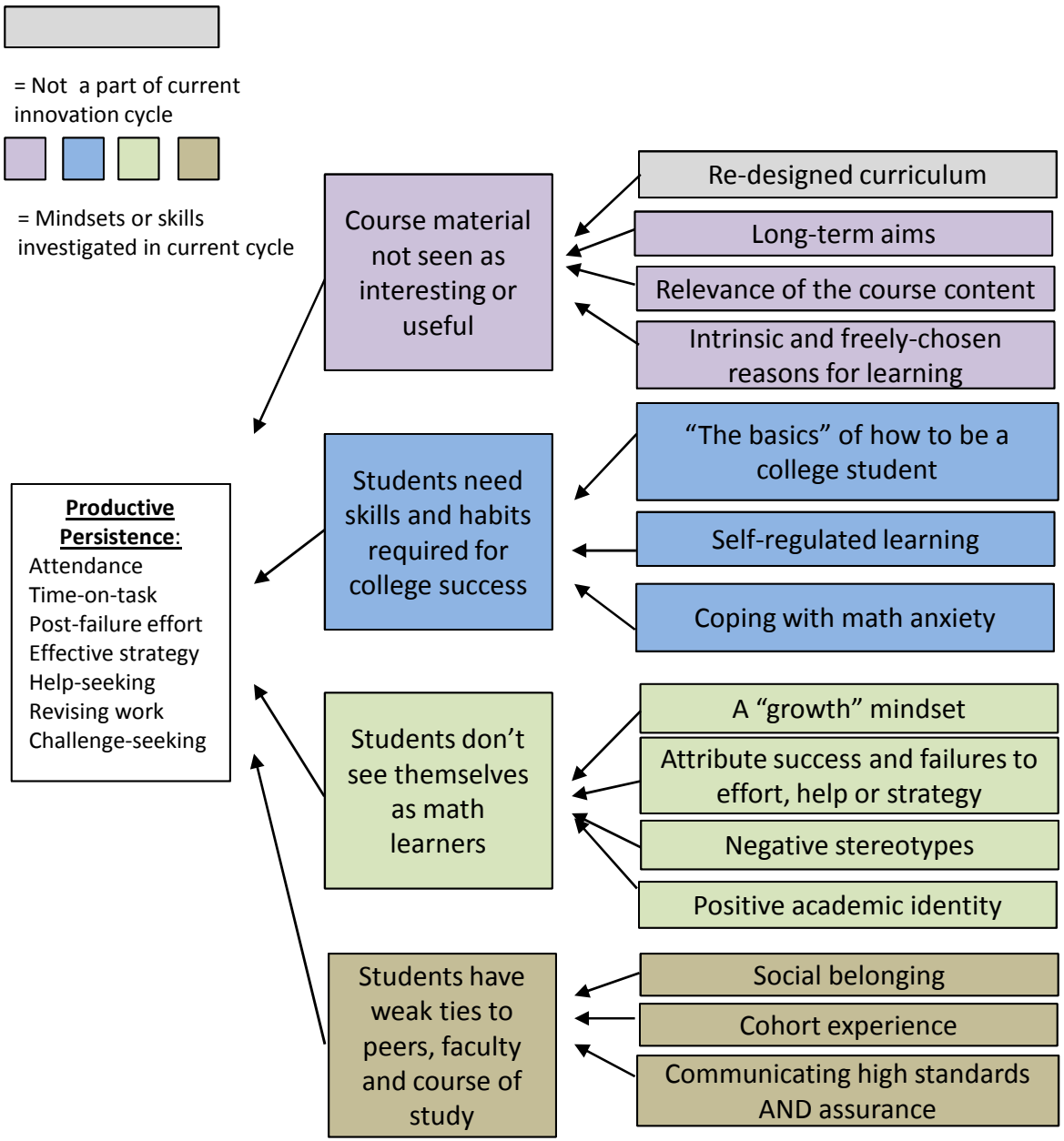

Students need skills and habits required for college success
Skills
Productive Persistence
Students don't see themselves as math learners
Course material not seen as interesting or useful
Students have weak ties to peers, faculty and course of study
Mindsets
Attendance
Assignments
Help-seeking
Learning from errors
Effort after failure
Embracing challenge

Video

When looking at the diagram…

- How do these factors play out, concretely, in your students in your college?
- If you moved these factors, would you achieve your aim?
- What is one question you have for the 90-day cycle team about these factors?

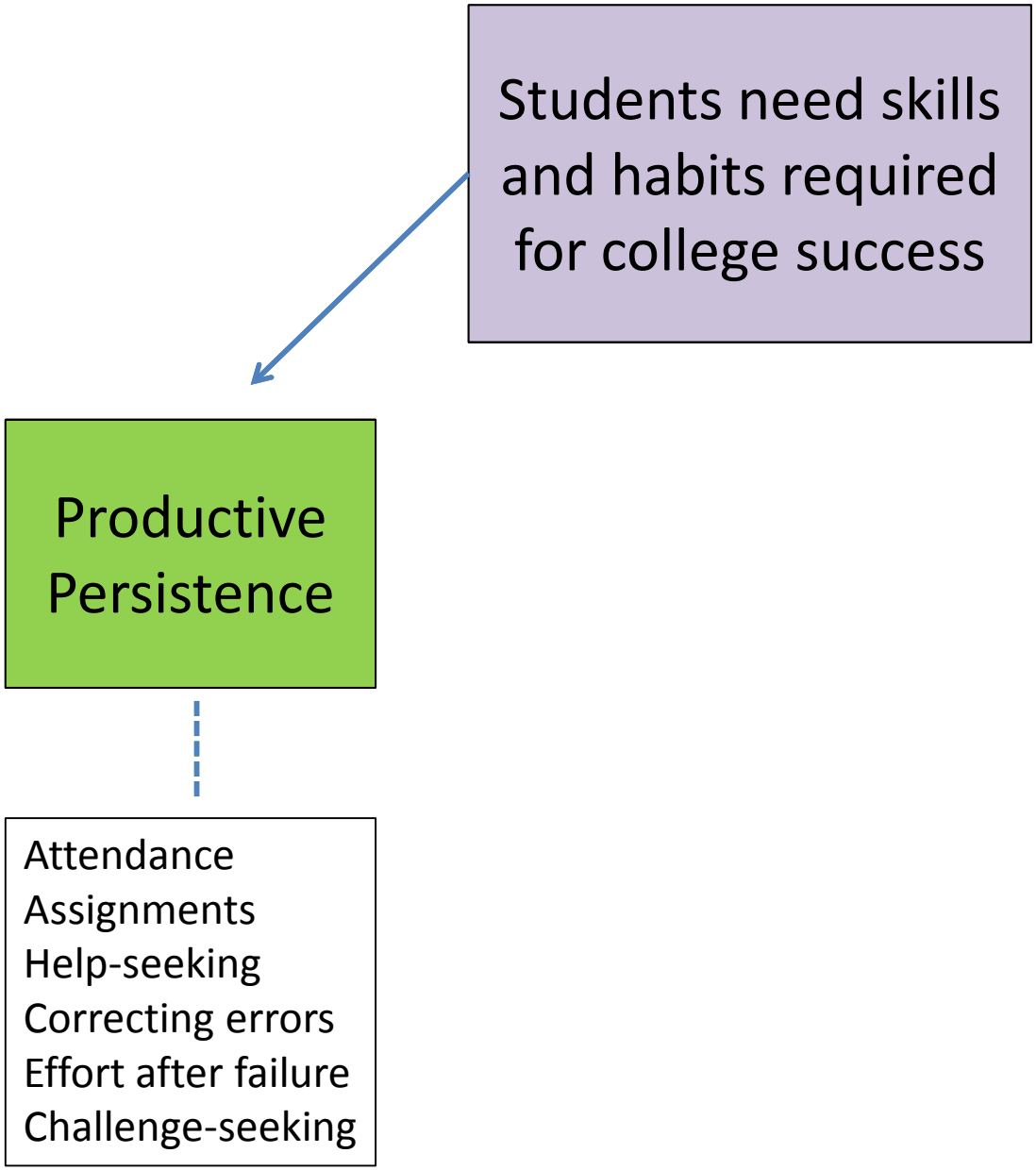
Driver diagram 12-31-10: “Probably wrong and definitely incomplete”



Let's Discuss at The End

- Will these drivers matter for my students in my college?

- Where will interventions take place? (and how can they be done at scale?)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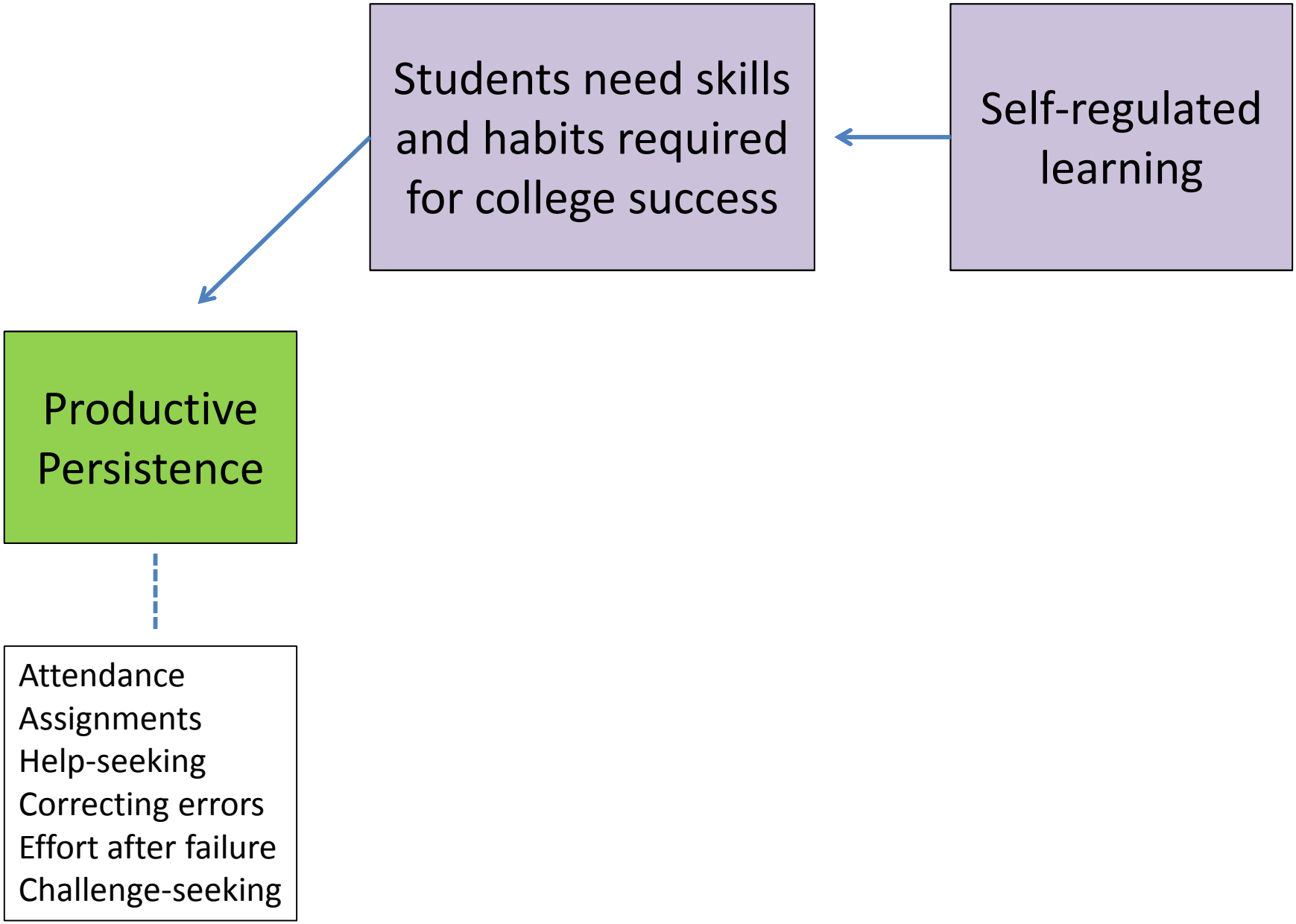
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Self-regulated learning
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Students need skills and habits required for college success

Quiz

Use the following rating scale to answer the questions before and after each problem

Definitely not confident	Not confident	Undecided	Confident	Very confident
1	2	3	4	5

Before **solving each problem, circle the number that represents how confident you are that you can solve it correctly.**		After **you have solved each problem, circle the number that represents how confident are you that you solved it correctly.**
1 ● 2 ● 3 ● 4 ● 5	1. Divide by long division $\frac{2x^2-7x+9}{x-2}$	**1 ● 2 ● 3 ● 4 ● 5**

Students need skills and habits required for college success

Quiz Reflection Form: Error Analysis

Revision Sheet, MA175 Quiz #____ Item # ____
Now that you have received your corrected quiz, you have the opportunity to improve your score.
Complete all sections thoroughly and thoughtfully. Use a separate revision sheet for each new problem.

PLAN IT

1 a. How much time did you spend studying for this quiz? _____

b. How many practice problems did you do in this topic area _____in preparation for this quiz? (circle one) 0 – 5 / 5 – 10 / 10+

c. What did you do to prepare for this quiz? (use study strategy list to answer this question)

2. After you solved this problem, was your confidence rating too high (i.e. 4 or 5)? Yes/no

3. Explain what strategies or processes went wrong on the quiz problem.

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Quiz Reflection Form: Practice

PRACTICE IT

4. Now re-do the original quiz problem and write the strategy you are using on the right.

$$\frac{2x^2 - 7x + 9}{x - 2}$$

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Quiz Reflection Form: Transfer

	Definitely not confident	Not confident	Undecided	Confident	Very confident
5. How confident are you now that you can correctly solve this similar item?	1	2	3	4	5

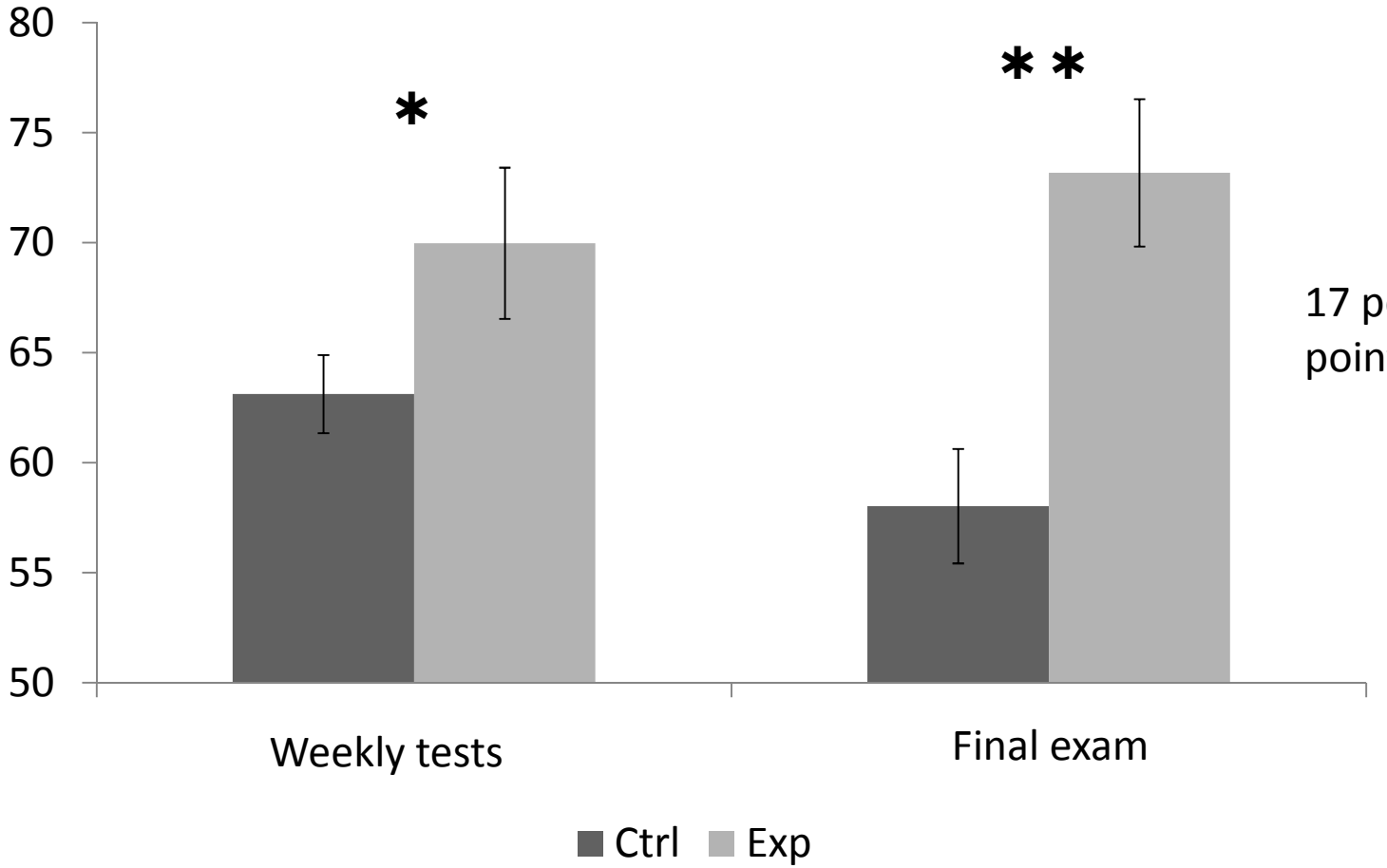
6. Now use the strategy to solve the alternative problem.

$$\frac{x^2+4x-8}{x-3}$$

7. How confident are you now that you can correctly solve a similar problem on a quiz or test in the future?	1	2	3	4	5

Students need skills and habits required for college success

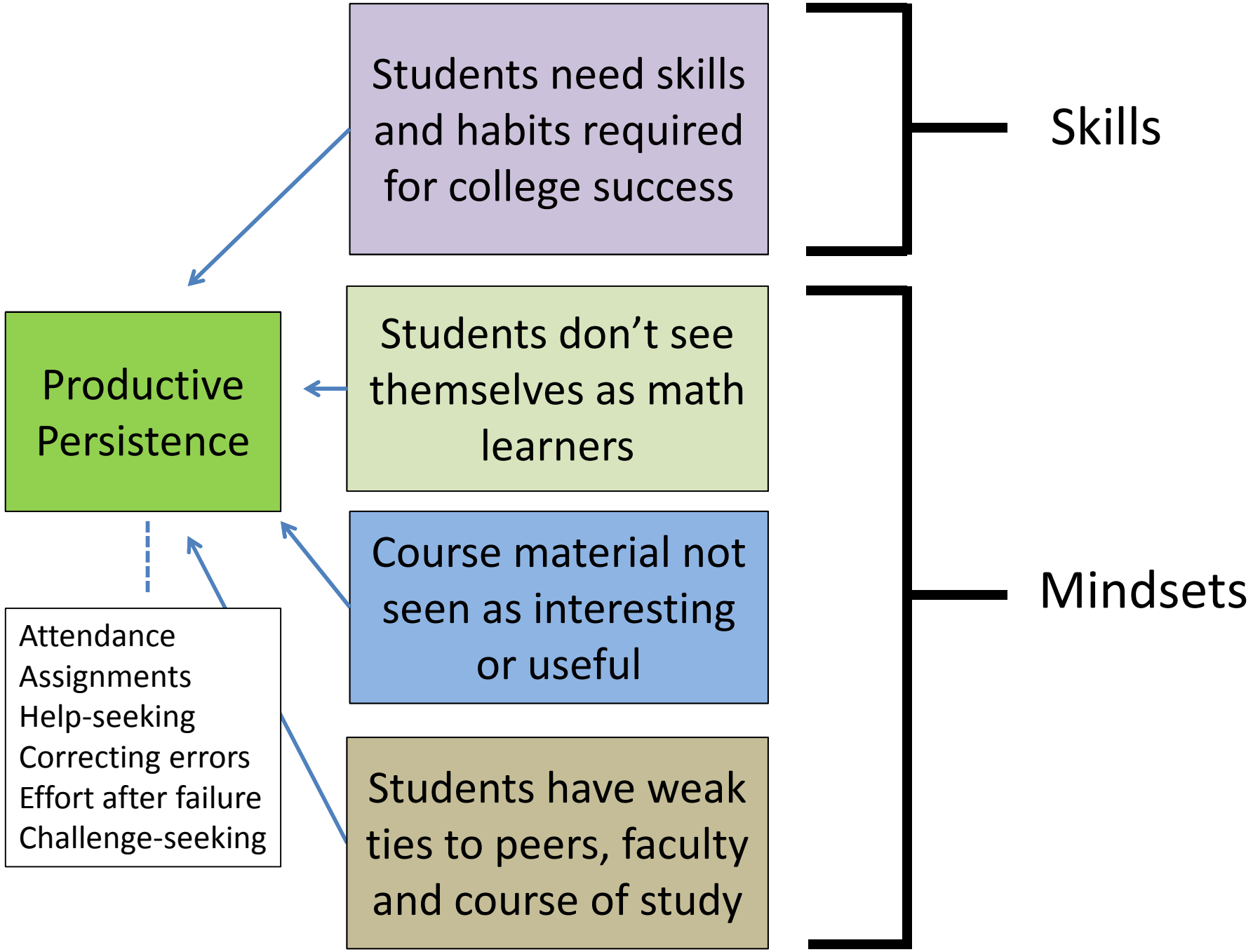
Math Performance



17 percentage-points

* $p < .05$; ** $p < .01$. Error bars are standard errors of the mean.

Zimmerman et al., in press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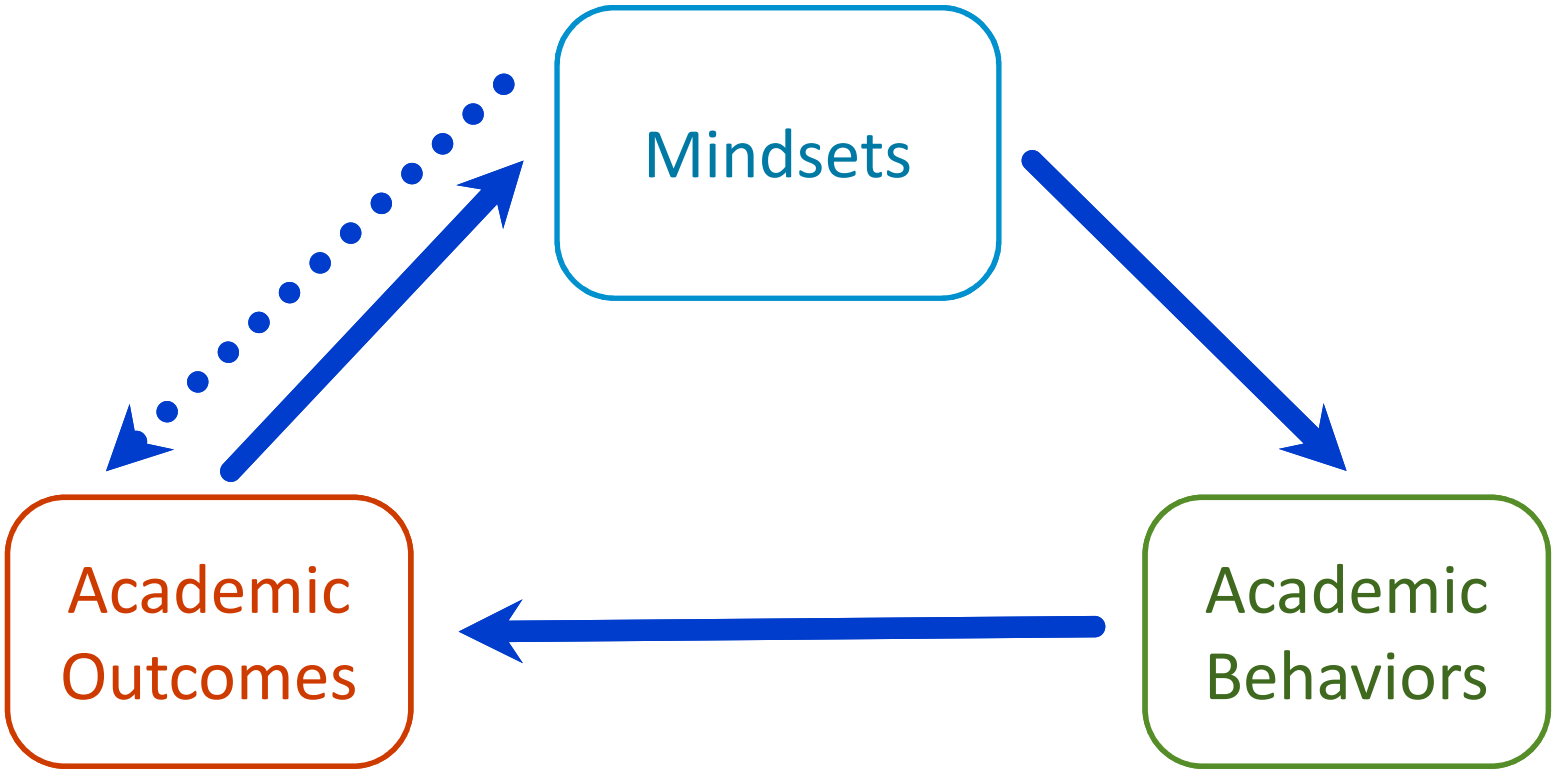
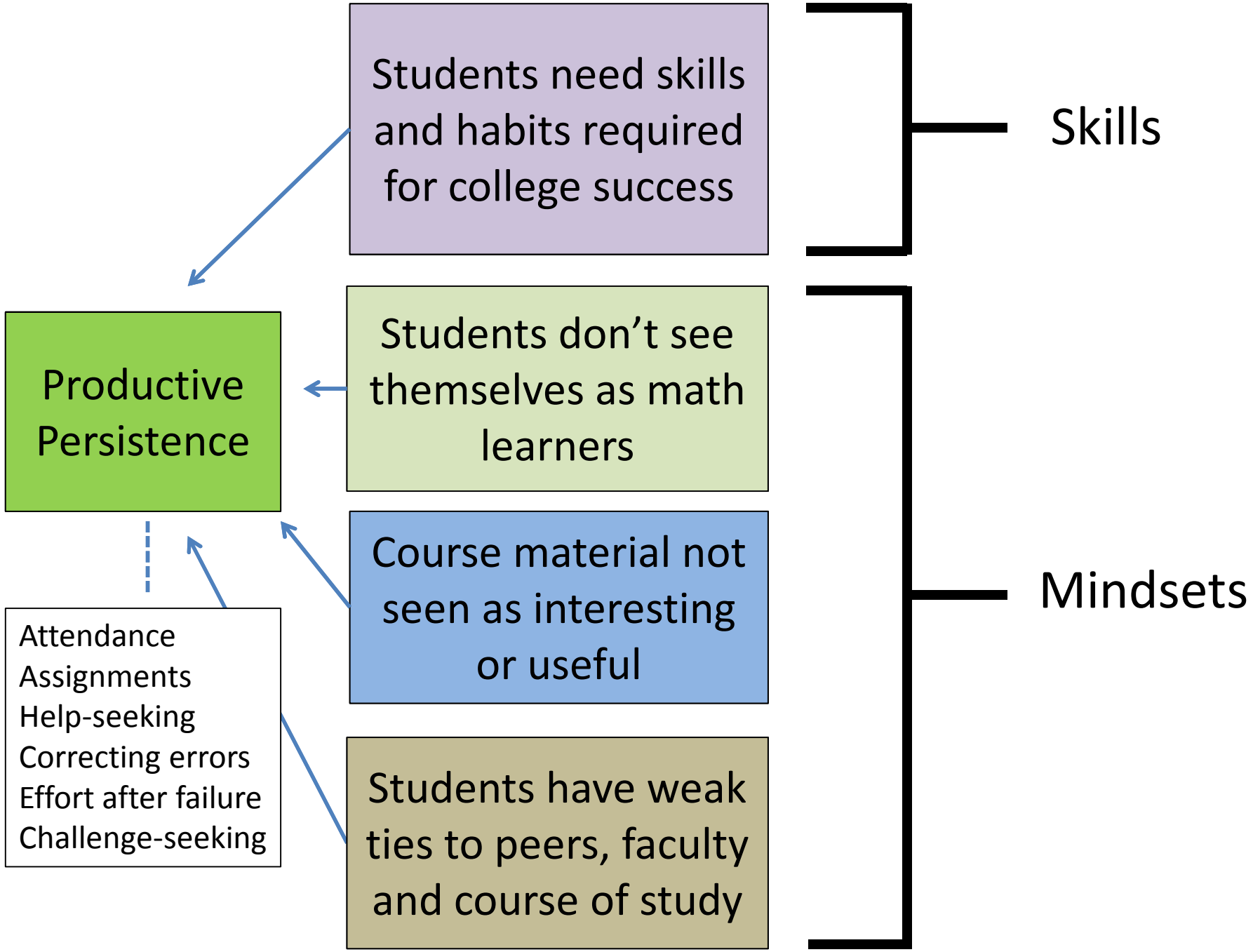
Mindsets: A feedback process...



Changing Mindsets

- Mindsets can be changed
- When they are, every lesson, failure, and success takes on a different meaning
- A new cycle forms, putting students on an entirely different academic trajectory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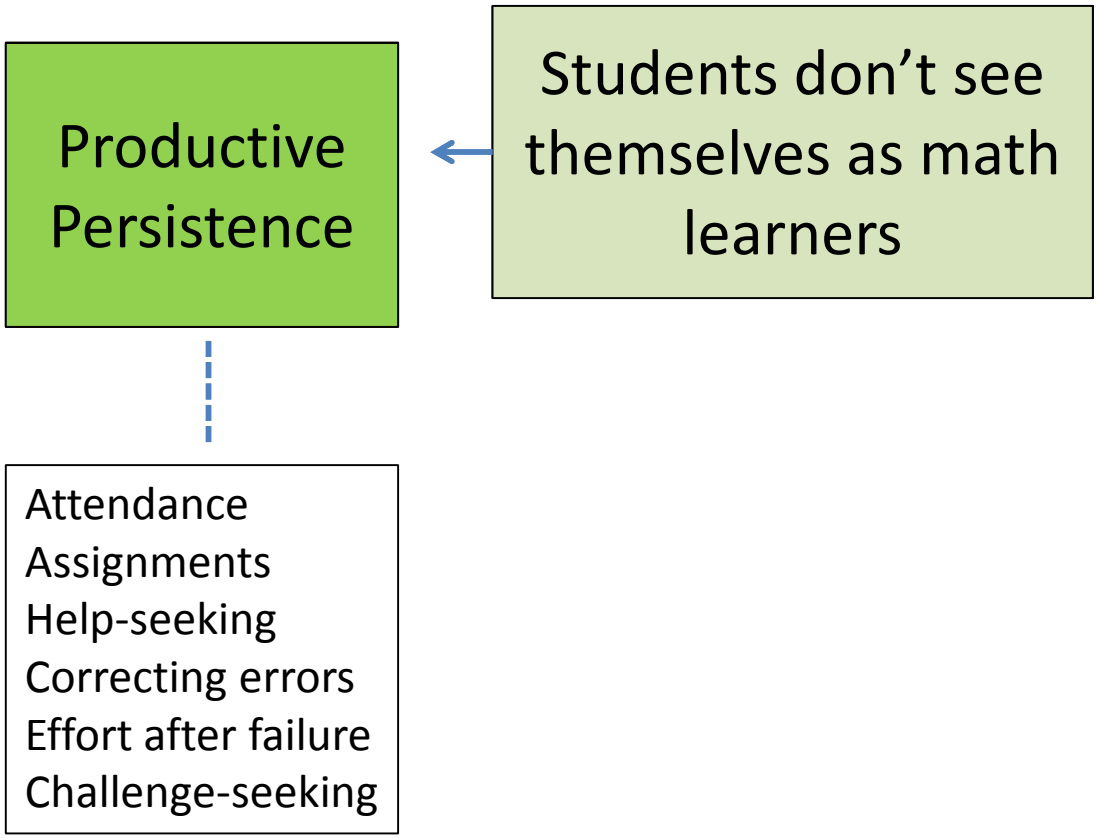
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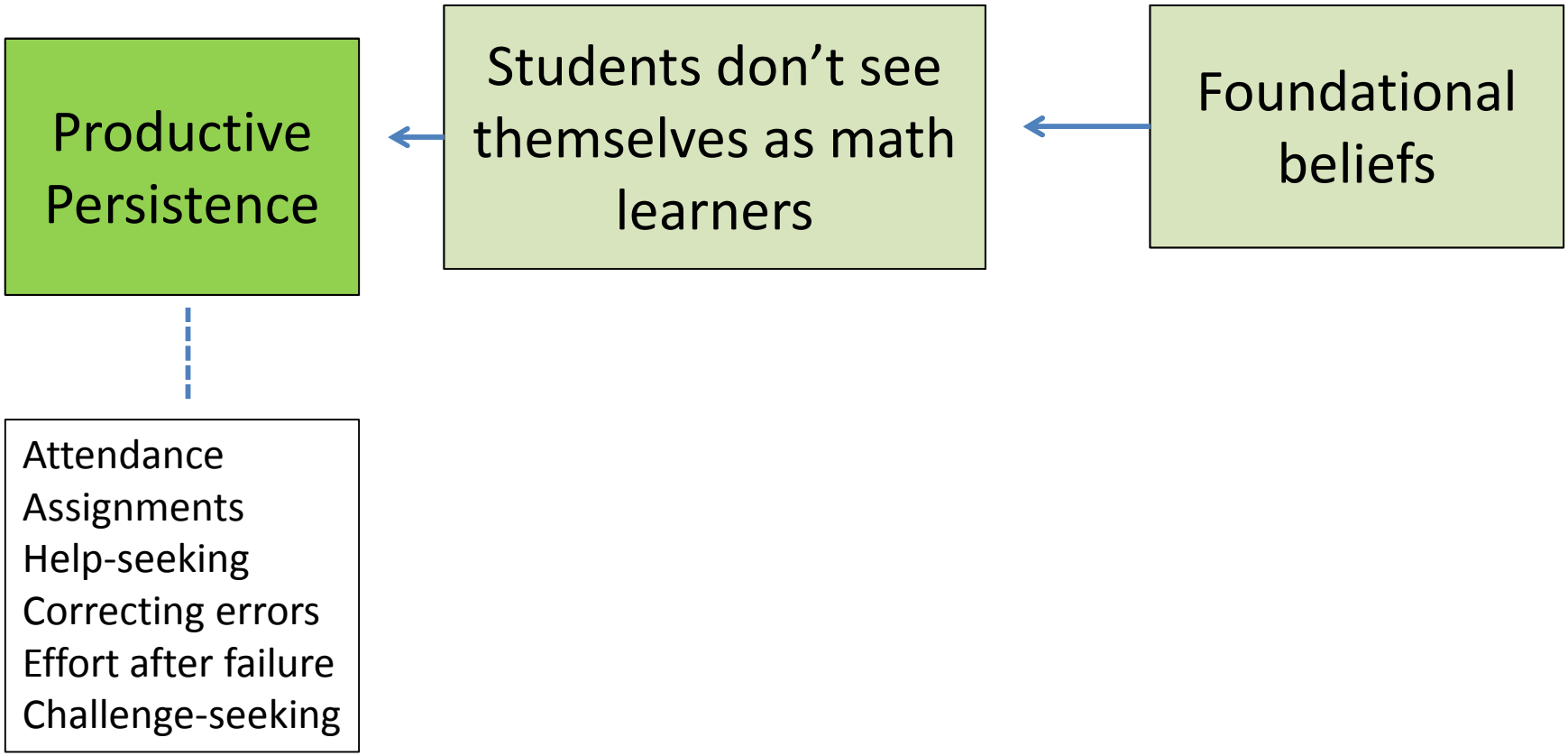
Foundational beliefs
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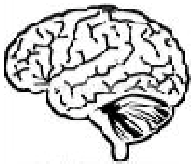
Students don't see themselves as math learners

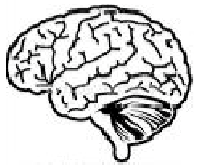
Beliefs about intelligence



- Fixed mindset (intelligence is fixed)
  - "If I have to try hard, I'm clearly not smart."
  - No point in trying if one is not a "natural"
- Growth mindset (intelligence is malleable)
  - "Trying harder makes you smarter."
  - Obstacles can be overcome through effort, help from others, and use of improved strategy
  - Note: It's NOT just about effort.

Students don't see themselves as math learners

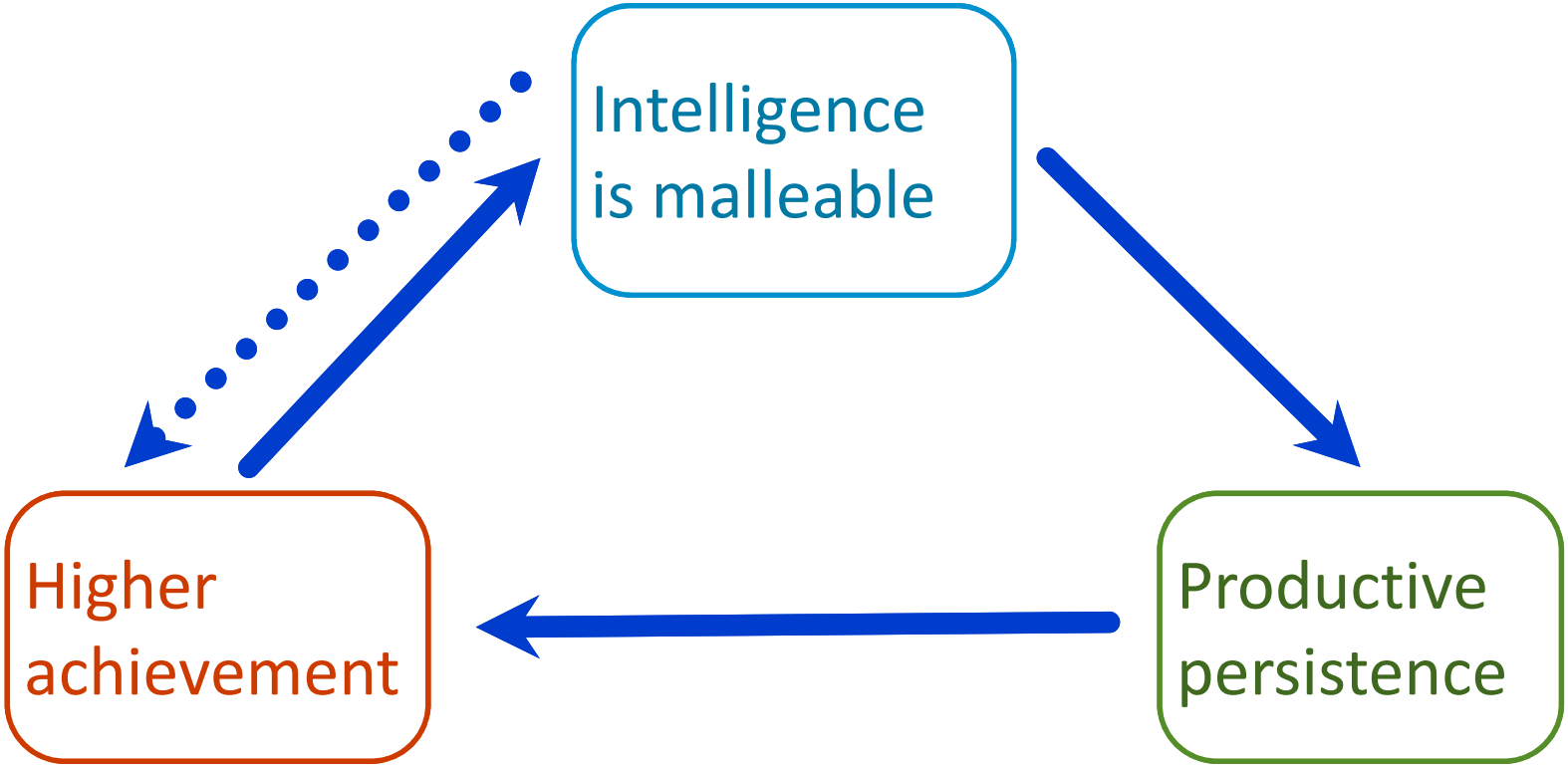
Beliefs about intelligence



	Fixed mindset	Growth mindset
goals	look smart	learn
values effort, help & strategy?	no	yes
response to challenge	give up	work harder and smarter
changes in grades	decrease	increase

Students don't see themselves as math learners

Growth Mindset Process



Students don't see themselves as math learners

You Can Grow Your Intelligence

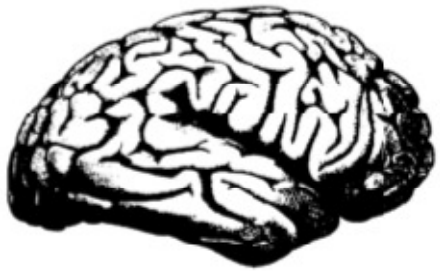
New Research Shows the Brain Can Be Developed Like a Muscle

Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born either smart, average, or dumb–and stays that way for life.

But new research shows that the brain is more like a muscle--it changes and gets stronger when you use it. And scientists have been able to show just how the brain grows and gets stronger when you learn.

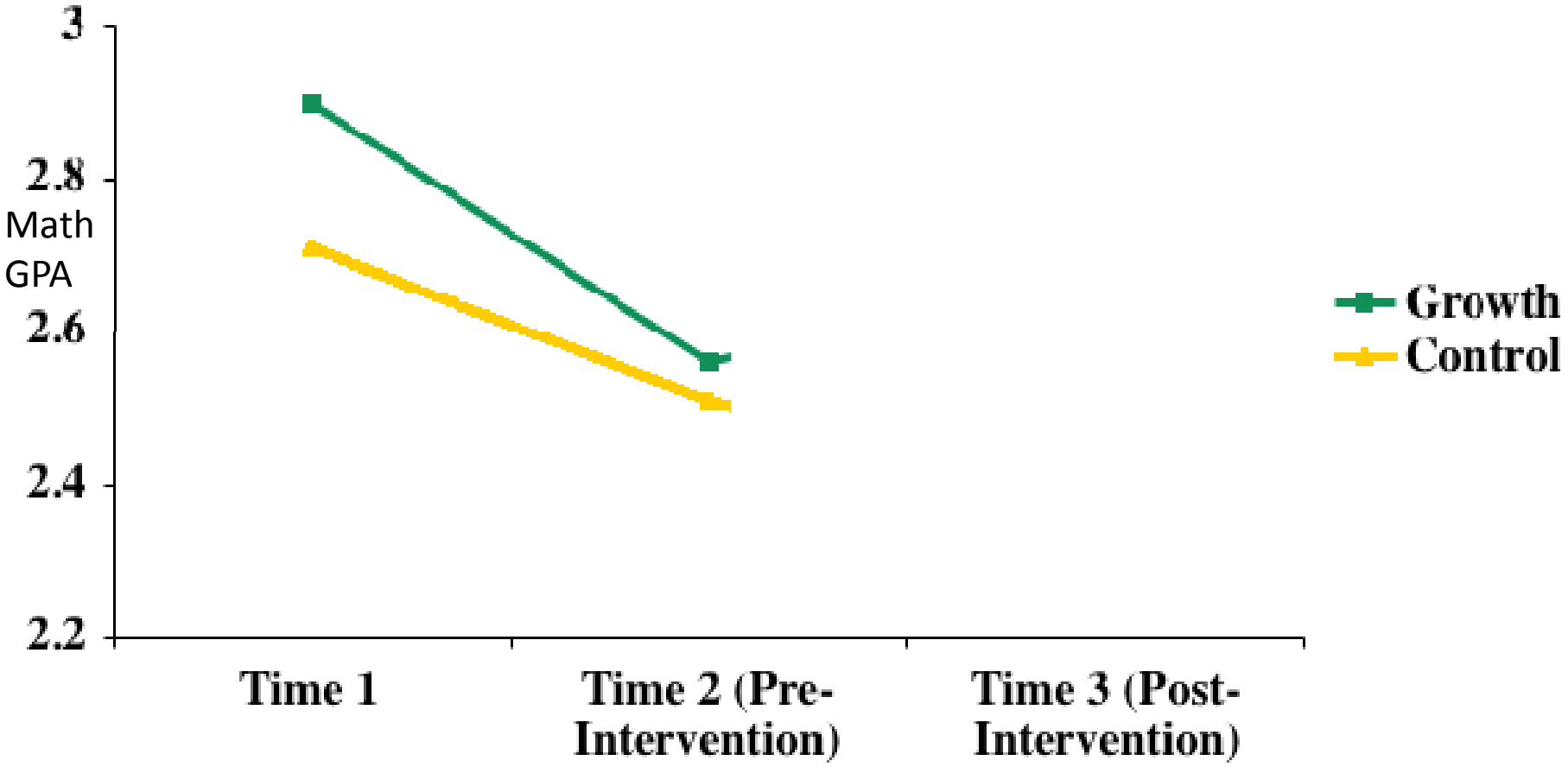
Everyone knows that when you lift weights, your muscles get bigger and you get stronger. A person who can't lift 20 pounds when they start exercising can get strong enough to lift 100 pounds after working out for a long time. That's because the muscles become larger and stronger with exercise. And when you stop exercising, the muscles shrink and you get weaker. That's why people say "Use it or lose it!

But most people don't know that when they practice and learn new things, parts of their brain change and get larger a lot like muscles do when they exercise.



Inside the cortex of the brain are billions of tiny nerve cells, called neurons. The nerve cells have branches connecting them to other cells in a complicated network. Communication between these brain cells is what allows us to think and solve problems.

Students don't see themselves as math learners



Blackwell, Trzesniewski, & Dweck, 2007

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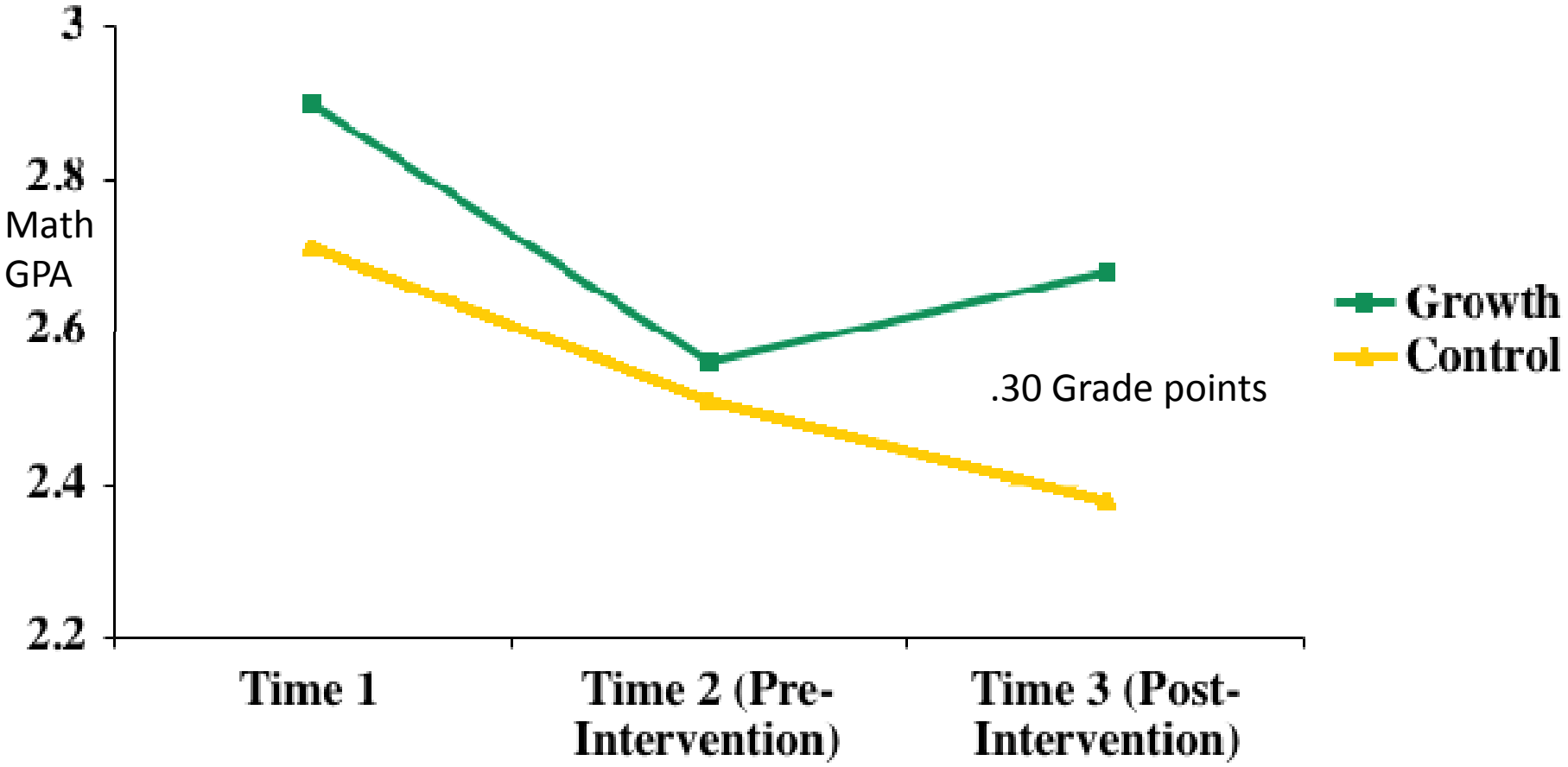

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Students don't see themselves as math learners

Replications with College Students

- Fewer dropped credits: Changed from **7.26** to **2.34**
  - Ruthig et al. (2004)

- 1st year college students growth mindset in only a single session, effects lasted 1 year
  - Aronson, Fried, & Good (2002)

Students don't see themselves as math learners

Stereotypes

- "People like me don't succeed here"
- Stigmatized students, in particular, may worry
  - That they are not fully accepted by their teachers or peers
  - That they will be evaluated according to stereotypes about their group
  - That they may confirm negative stereotypes about their group

Students don't see themselves as math learners

Stereotype Threat

Stereotype threat: the worry of confirming a negative stereotype about one's group

When people are put in a situation in which they could confirm a negative stereotype about their group, worries about confirming the stereotype can be distracting and discouraging

Students don't see themselves as math learners

Mechanisms

- Students put under stereotype threat experience
  - Decreased working memory capacity. Memory span reduced 39% under stereotype threat (Schmader & Johns, 2003)
  - Reduced ability to remember what they study (Jones & Walton, in review)

Students don't see themselves as math learners

Long-term effects

- Stereotype threat also reduces
  - Willingness to seek help when struggling (Walton & Cohen, 2007)
  - Feelings of connection to school (Sherman et al., in prep.)
  - Identification with school over time (Steele, 1997)

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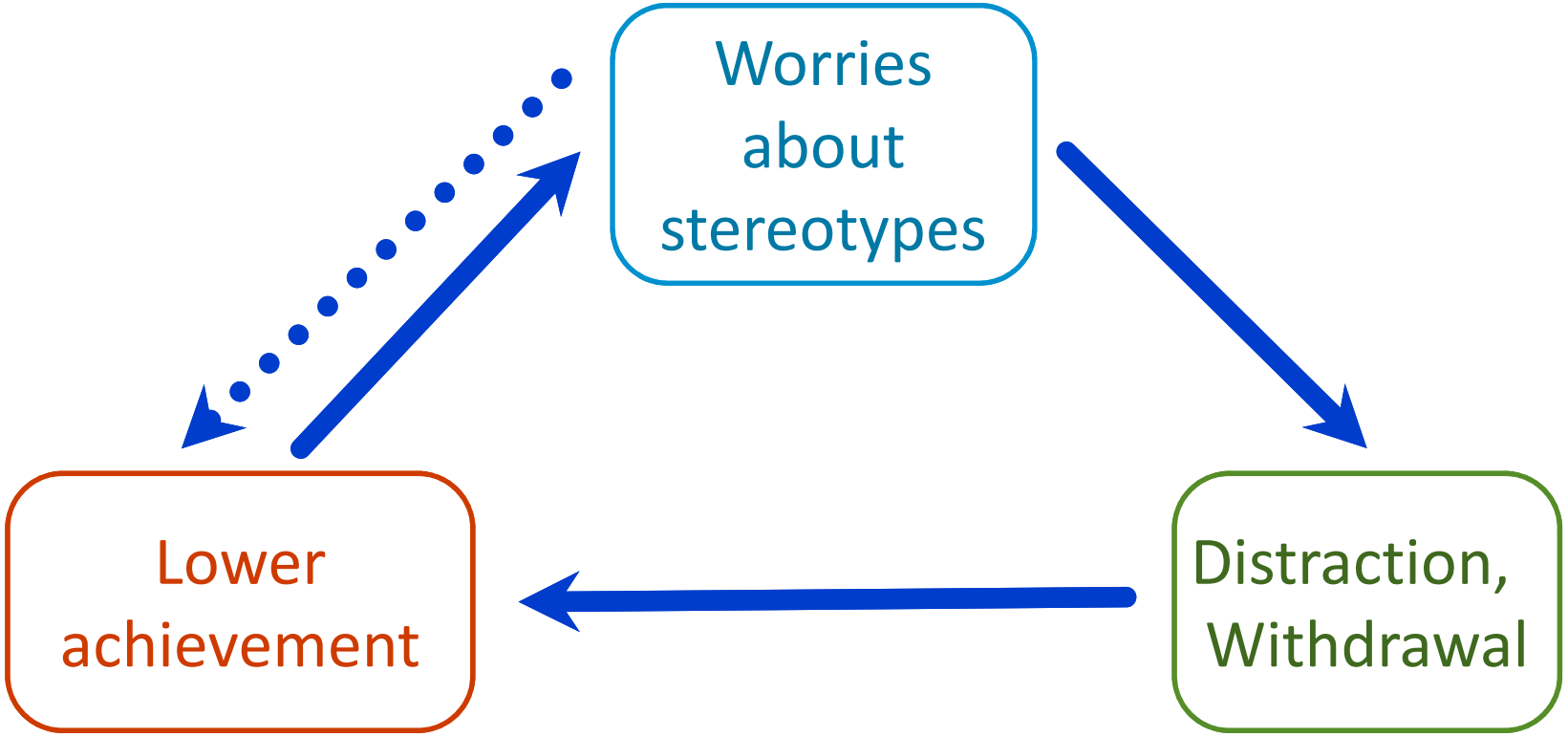
Stereotype Threat Cycle



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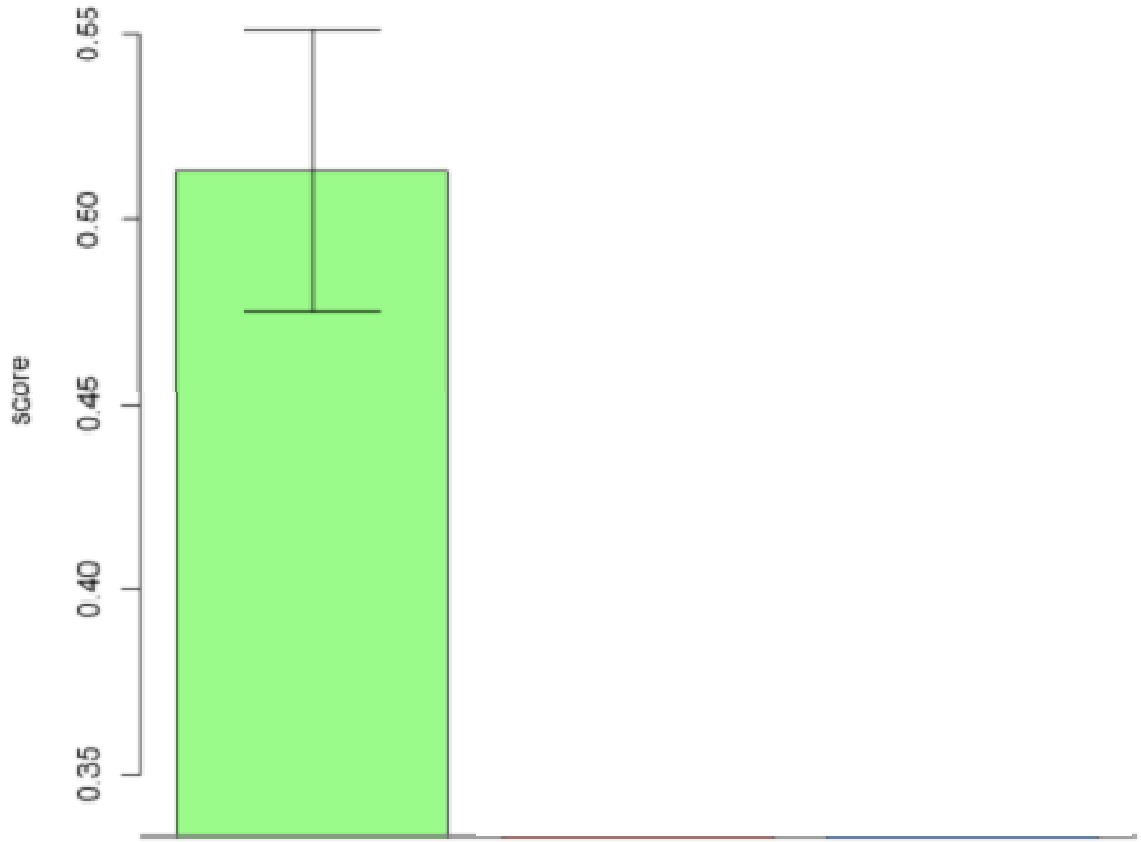
Foothill College Students: Scores on Math Tests



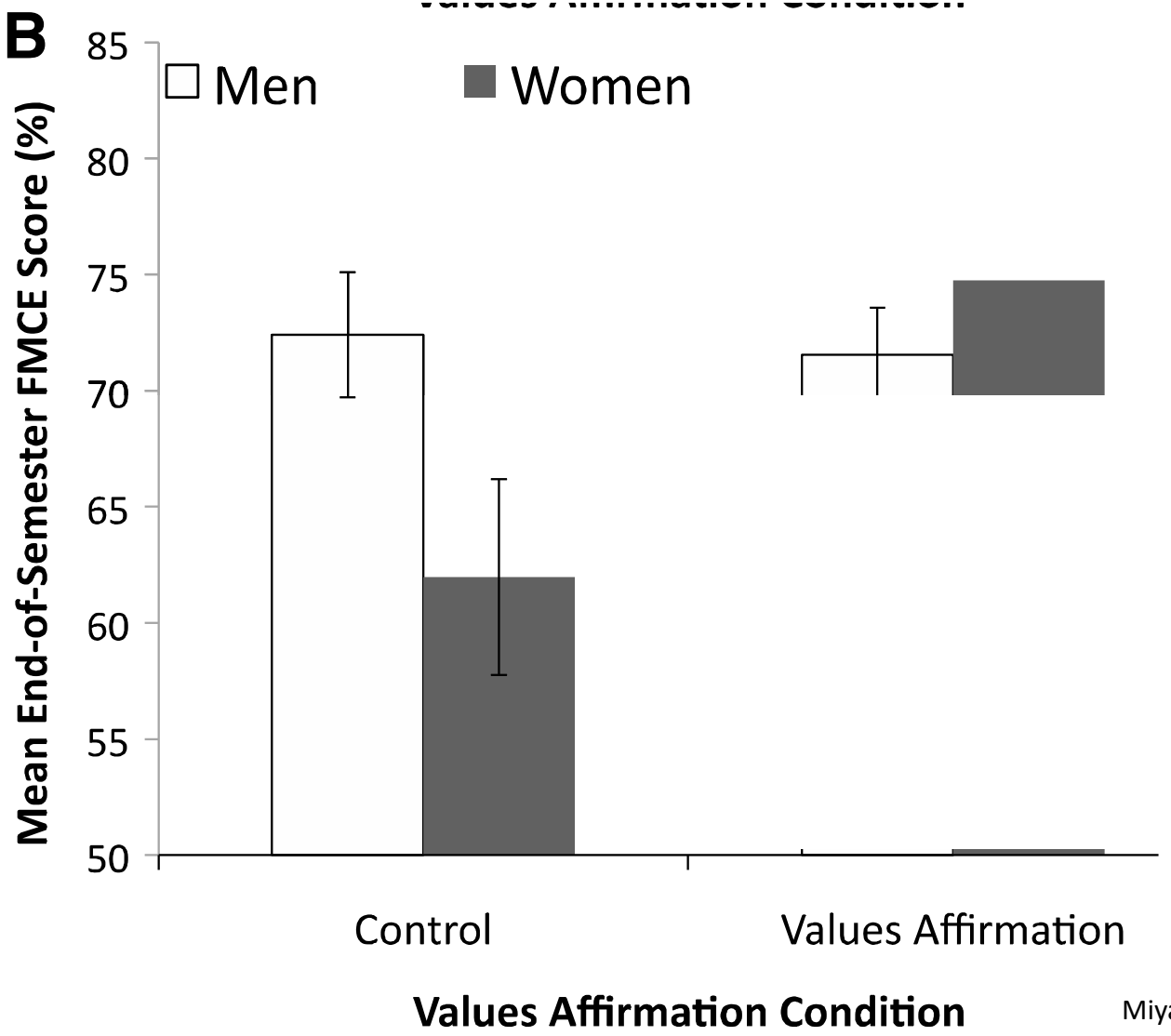
Students under threat scored 13% lower

New mindset eliminated the negative effect of threat on math scores

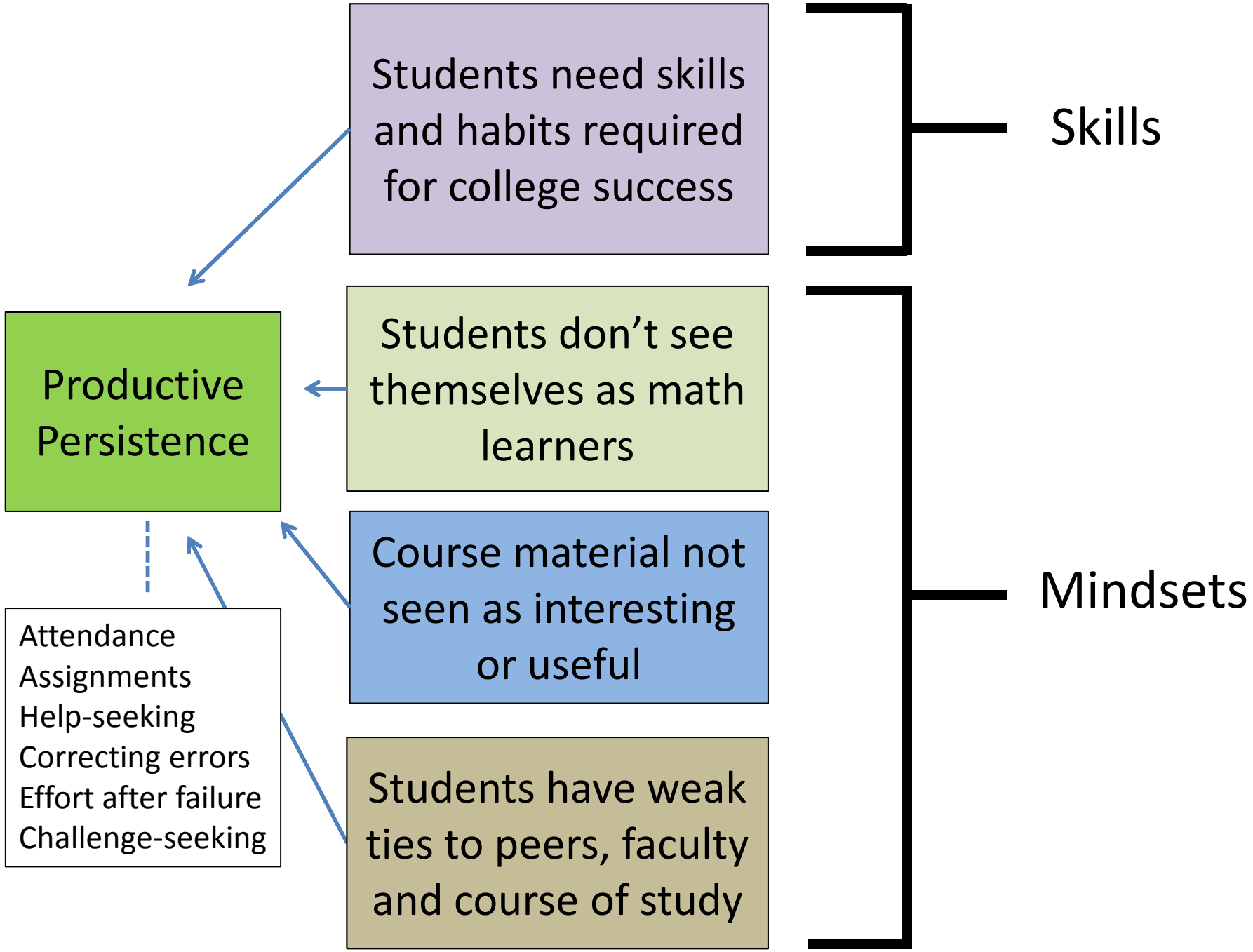
Paunesku & Walton, in prep.

Students don't see themselves as math learners

Do These Effects Last?



Miyake et al., 2010, *Science*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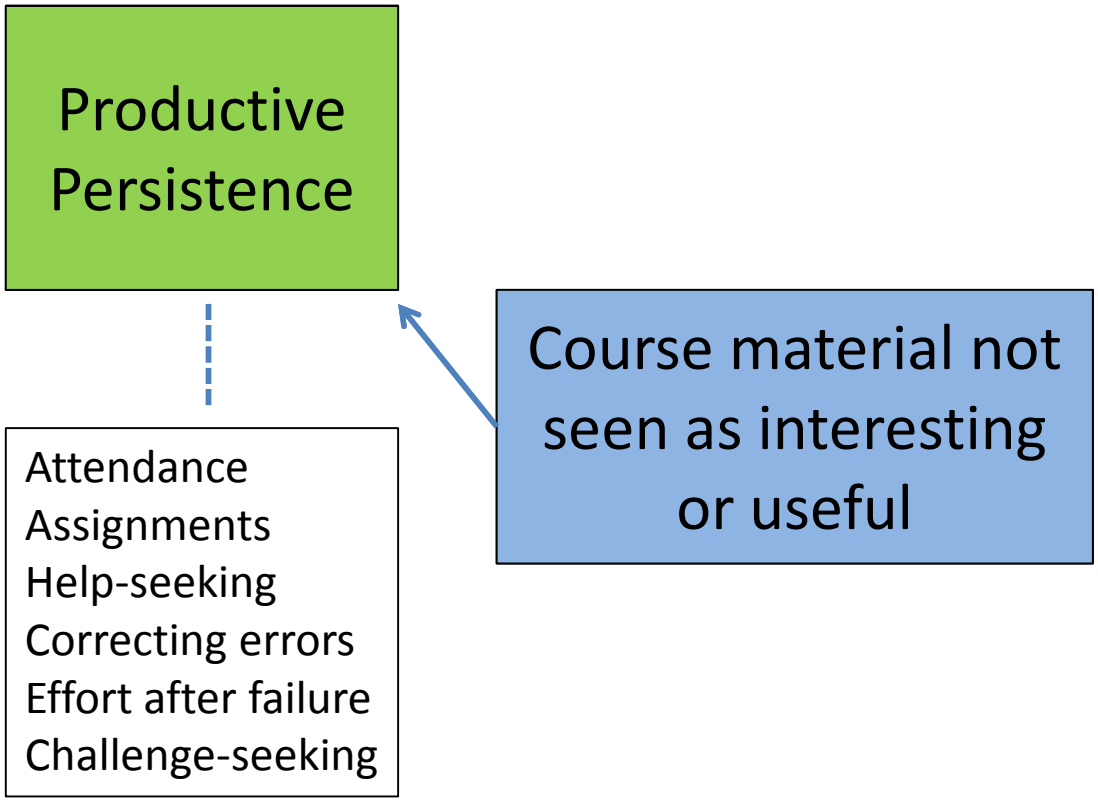
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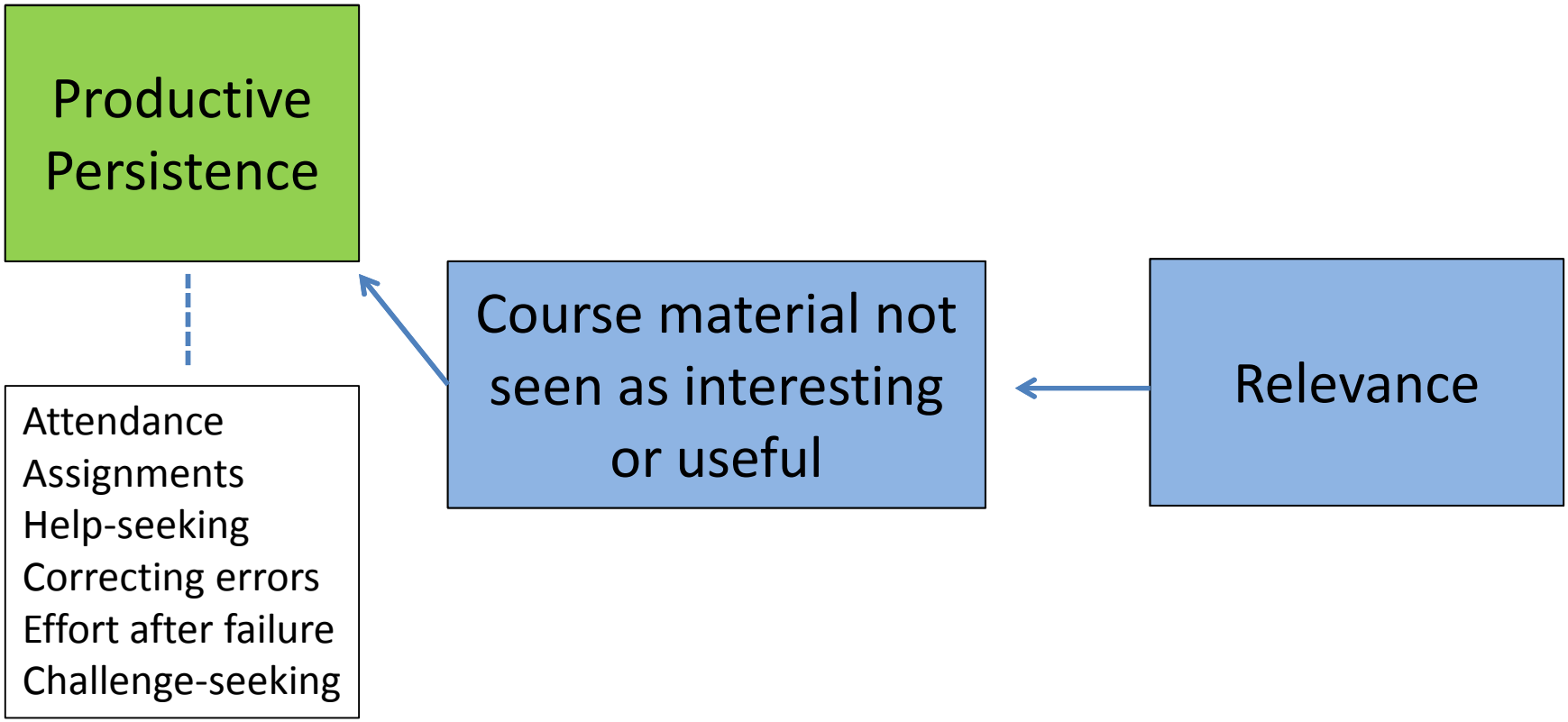
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Relevance

Course material not seen as interesting or useful

Relevance Intervention

1. Select a topic that is currently being covered in class.

2. Write a one-paragraph essay that applies the topic to your life or to the life of someone you know (control: just summarize).

3. Repeat 3-5X over course of semester.

Hulleman & Harackeiwicz, 2009, *Science*

Course material not seen as interesting or useful

Graphing is important part of life because when you're trying to compare different data the graph is the best way to go. For an example, my grandmother and aunt work at a retirement home and they need to decide dosages per day, meals, and etc. Graphing out all the data they have will [help them] come out with a resolution.

Hulleman & Harackeiwicz, 2009, *Science*

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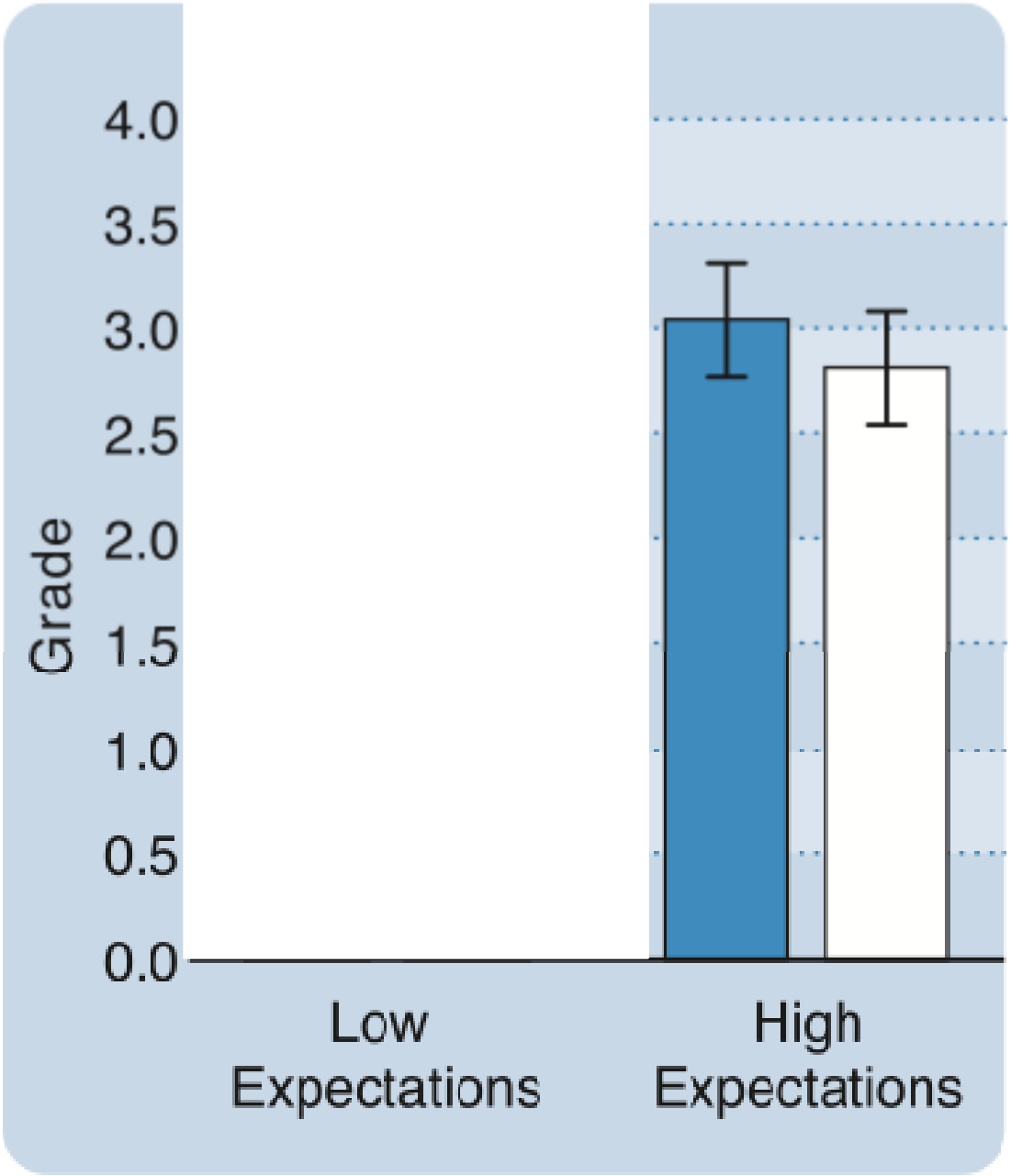

No difference

Hulleman & Harackeiwicz, 2009, *Science*

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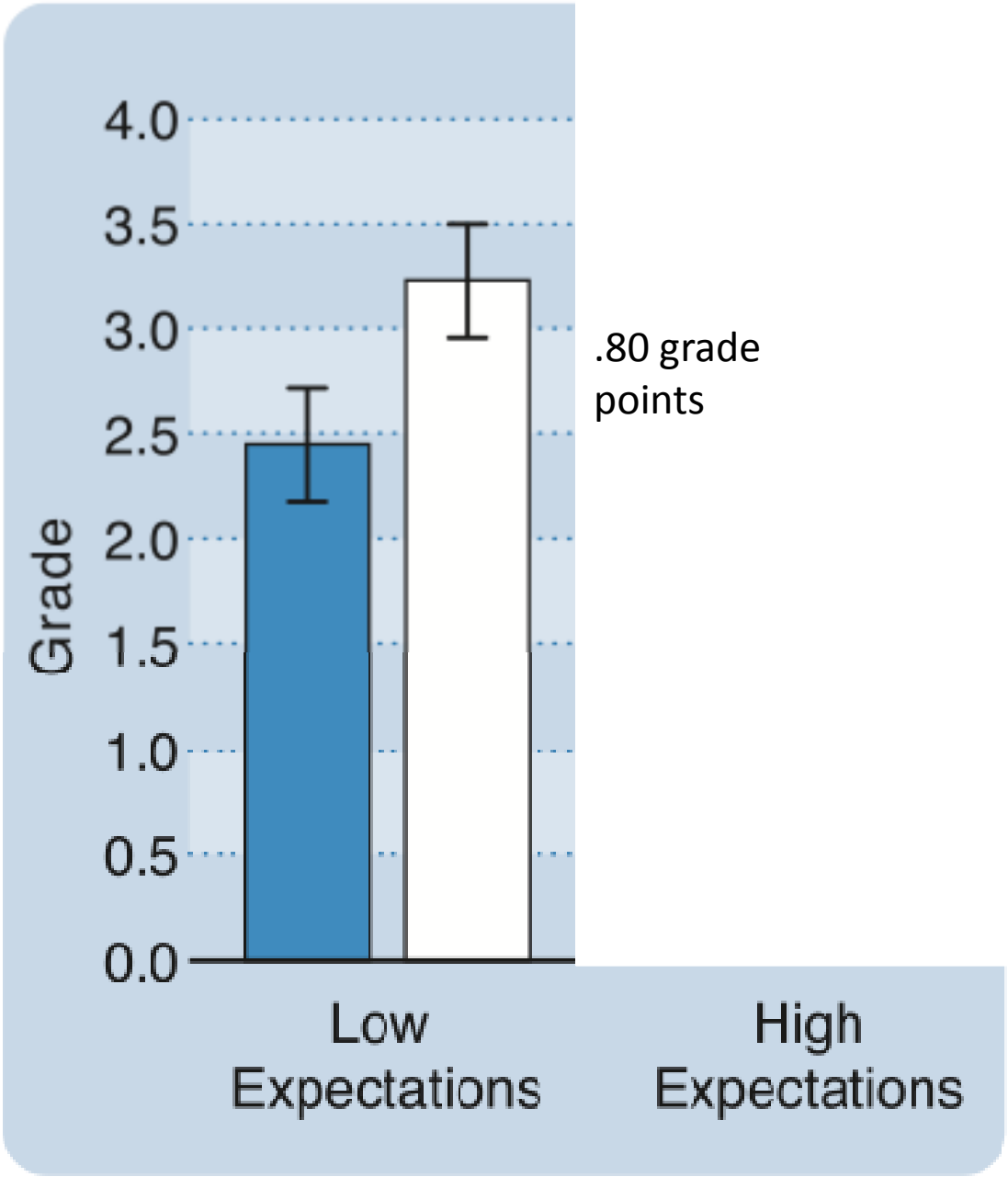
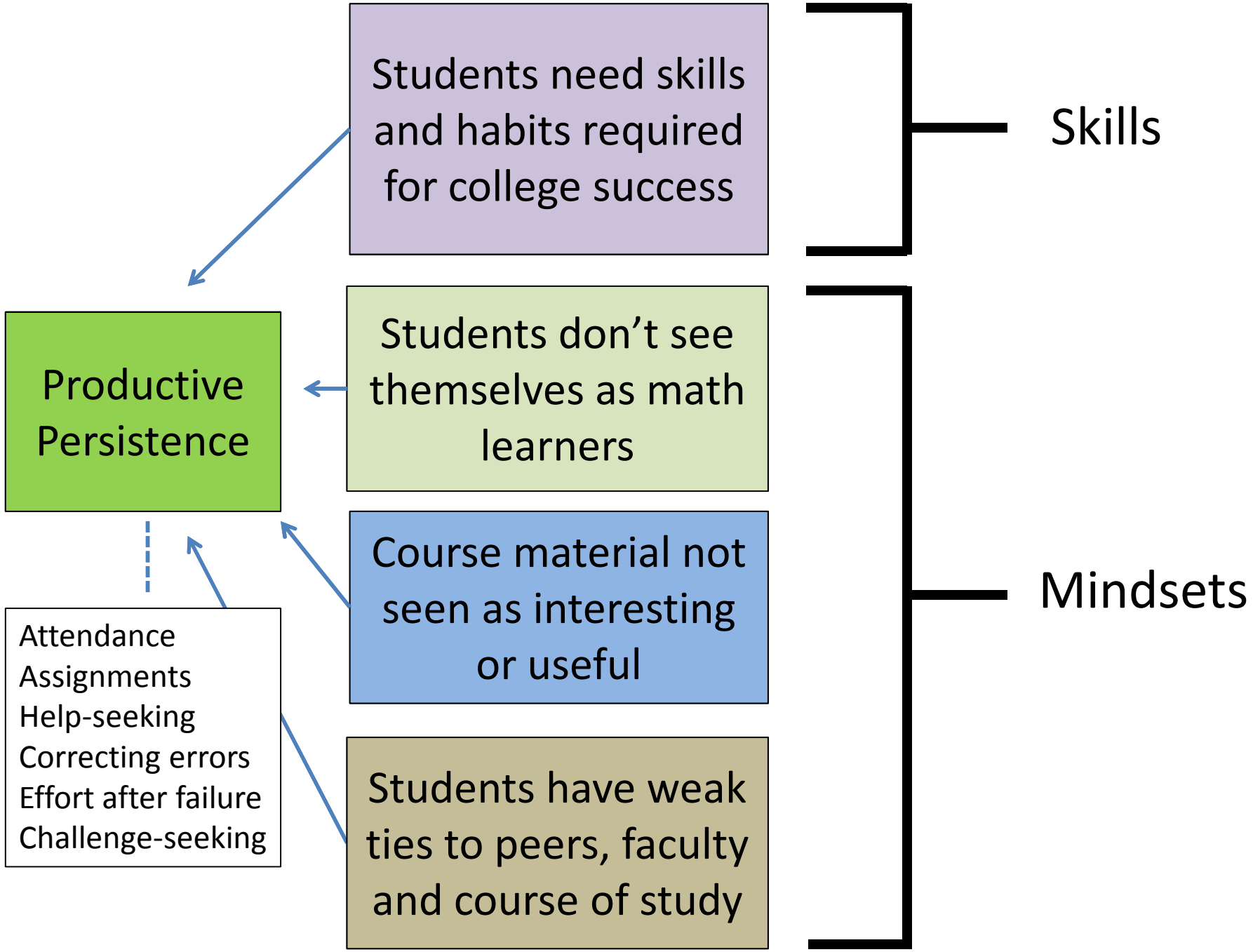


.80 grade points

Hulleman & Harackeiwicz, 2009, *Science*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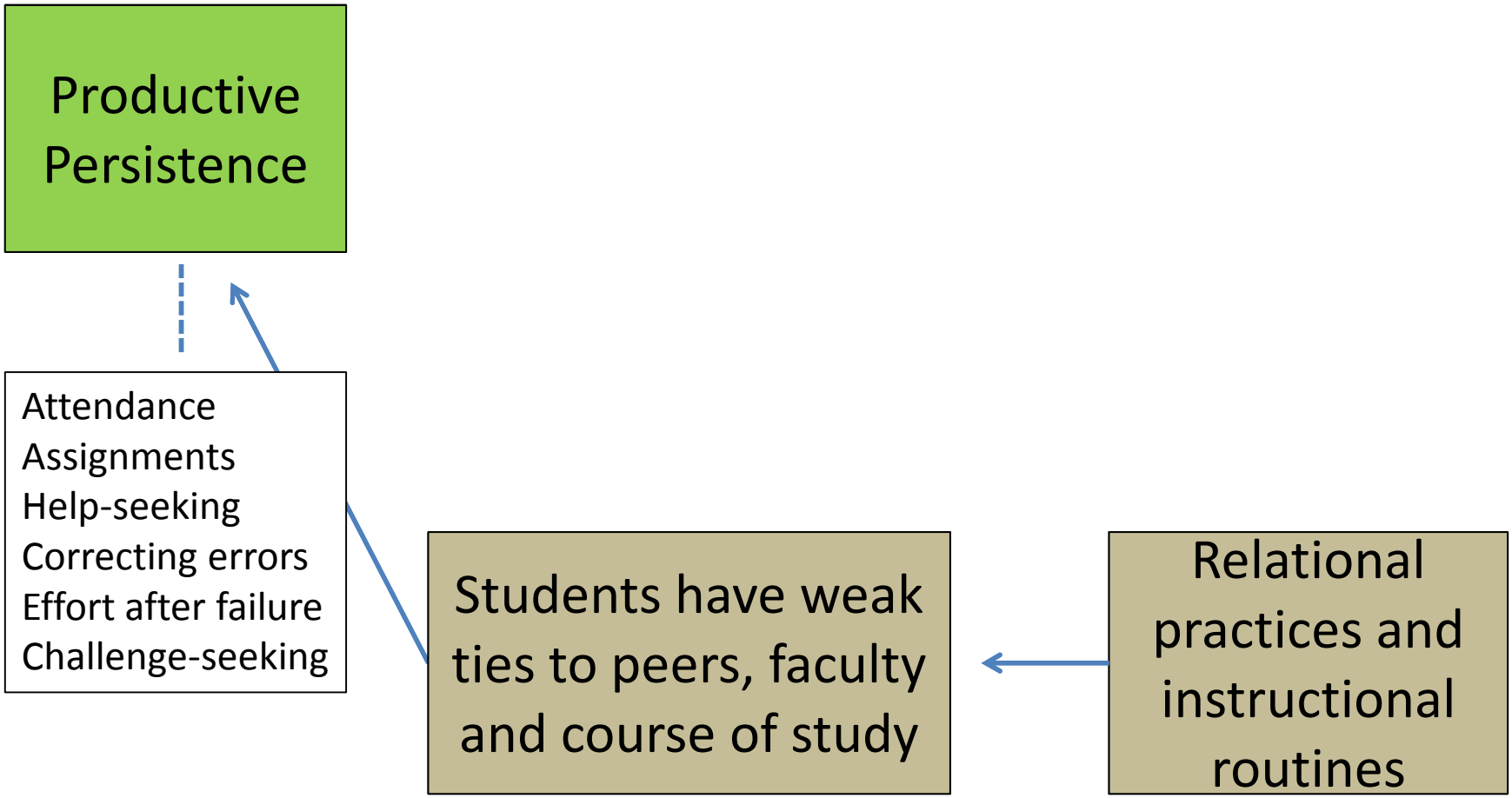
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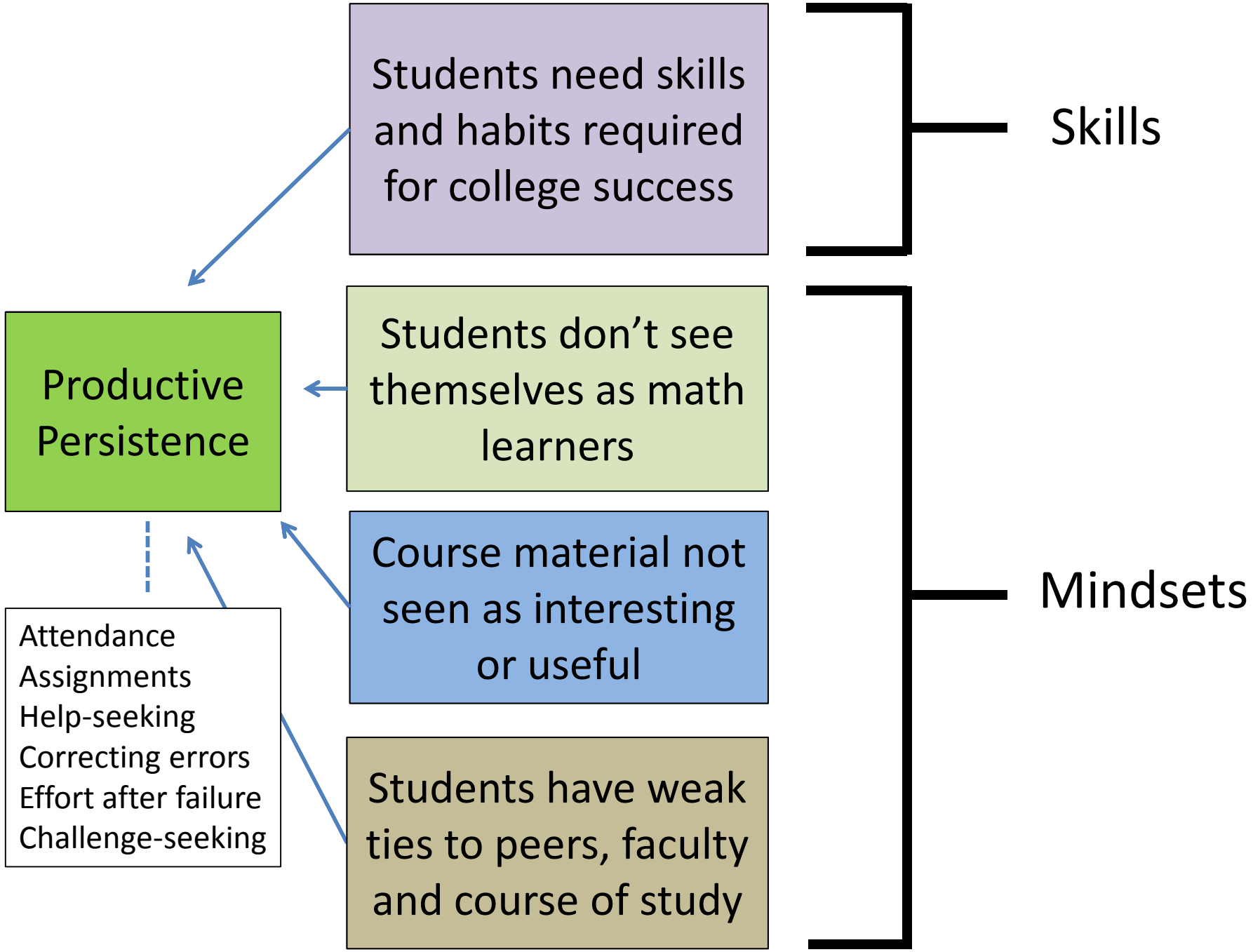
Relational practices and instructional routines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Psychological Interventions

- Improve mindsets that influence the way students view school
- Do not replace curricula; they make students less distracted and more motivated
- GPA improvements of 0.2-0.3 are typical (Wilson, 2006)
- Interventions are brief, 20 minutes - 6 hours
- Higher trajectory is sustained (Cohen et al., 2009)

Limitations

- These methods are still novel

- Questions to answer before implementation
  - What conditions are required?
  - Who are interventions most effective for?
  - What intervention elements are necessary?
  - How can the messages be delivered consistently and efficiently?

Three Improvement Projects

- 90-day cycle: Which of these drivers can we affect in the first 3 weeks? What activities, supports and norms would be appropriate? How do we know?

- Project: SRL in the curriculum

- Project: Engineering procedures and materials for online interventions

Driver diagram 12-31-10: "Probably wrong and definitely incomplete"